# SCIENCE:

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Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.


## JUGGLERY.[1]

RECENTLY I met with a certain observation the source of which, to my regret, I failed to note. I therefore take the opportunity of appealing to my readers for their kind help in identifying the passage or quotation in question, because it has a scientific bearing of a very obvious nature. The observation was as follows: A writer, in speaking of the fallacies of the senses, described the Hindoo juggler's trick of causing a small plant to grow out of a flower-pot in which, a few moments before, the conjurer had placed some seeds. The pot is covered over or concealed by a blanket, and when the covering is withdrawn the apparently marvellous and instantaneous growth of the seed into a perfect plant is witnessed. Now, the writer in question goes on to state that an amateur photographer had taken a "snap-shot" at the conjurer and his performance, and when the negative was developed no plant could be seen growing in the pot at all. The inference is that the spectators only fancied they saw a plant, and that the success of the trick is due to the juggler making his audience believe they see what does not really exist. In plain language, he is supposed to hypnotize the spectators, and the illusion is to be regarded not as due to his dexterity but to his power of making the spectators believe they see what he wishes them to behold.

Assuming the incident with the camera to be true and of good report, how is the omission of the flower in the pot to be accounted for? If a photograph of the scene had been taken at all, it must necessarily have included all the details within range of the lens, and, as Boucicault makes one of his characters in "The Octoroon" say, "The apparatus doesn't lie." I do not pretend to criticise the statement at all. I am merely anxious to know if any of my readers interested in psychical matters can confer a favor by referring me to the original source of the story. My own recollection is that I casually met with the reference in an American magazine, which I glanced at while waiting for a friend. The name of the magazine and its date (which must be recent, I fancy) have both escaped my recollection.

After thinking over the above incident, one is inclined to be somewhat sceptical of the story as I have related it — although my version, I admit, may not be absolutely correct. A perusal of a paper by Chevalier Hermann, the conjurer, confirms me in my scepticism. He tells us that when he visited India he could find no foundation in actual fact for the marvellous stories of Hindoo jugglery, including the fact of "youths tossing balls of twine in the air and climbing up on them out of sight." What Herr Hermann did see in India, he tells us, he could have imitated "with little preparation," and that he "would not presume to introduce them upon the stage." This is a decided blow to the reputation of our Indian friends, and after this assertion the tales of fakirs being buried for six weeks, and recovering thereafter, may reasonably be doubted also, although I shall feel interested in hearing from any of my Indian readers accounts of what they have actually seen in the way of startling magic. It will be interesting if I quote what Hermann has to say of the flower-pot trick, which the unknown psychologist has tried to explain on the basis that the conjurer causes his audience to see what does not exist — a startling enough theory, by the way, since it supposes that all sorts and conditions of men looking on could be simultaneously hypnotized.

In Bombay a troupe of jugglers appeared in front of the hotel in which Herr Hermann was staying After a short address, an empty flower-pot was produced. This was filled with earth, which was moistened with water, and into the pot a few mango seeds were dropped. A large piece of cloth was used to cover the pot, which rested upon a tripod of bamboo-sticks. Then followed an address to the audience, and the operator walked slowly round the covered pot, "dexterously allowing his robes to envelop it at each turn," while the other members of the troupe chanted a kind of incantation. After some three minutes occupied in this performance, the incantation ceased, the cloth was removed, and in it was seen growing a mango-tree about three feet in height, the plant having apparently grown after the planting of the seed. This is a bare description of what the Western conjurer saw his Eastern rivals perform, and it sounds very wonderful, no doubt. Hermann's explanation of the trick, however, causes us to repeat the hackneyed expression that "it is not at all startling when you know how it's done." What the Hindoo wizard did was to remove the pot from beneath the cloth — a dexterous proceeding enough, but not a whit more wonderful or clever than things we see done at the Egyptian Hall or at other entertainments of like nature — and to substitute the growing mango, which he carried concealed under his robe. "This," adds Hermann, "he did rather clumsily, while he let the robe rest, as if by accident, over the covered flower-pot previously displayed."

This recital is interesting scientifically, because, as I have said, we hear so much about Indian jugglery and esoteric mysteries, which no science is supposed to be capable of explaining, that one may find some justification for a continued display of scepticism when still more mysterious feats are gravely detailed. I find that the facts about Indian magic and mystery set forth in books in grave, circumstantial array do not always coincide with what actually occurs; hence my appeal to Indian readers of these lines for accounts of things they may have seen in the way of live burials and resuscitations (if such things are still in vogue) and like phenomena.

[1] Dr. Andrew Wilson, in the Illustrated News of the World.

I referred, when I began these jottings, to the idea that the explanation of a trick was to be found in the delusion of the spectator's senses; and this reminds me of a very interesting case which certainly proves to us how a dominant idea may be impressed on the minds not of a few spectators but of thousands, with an utterly futile result when all is said and done. When the Crystal Palace took fire, many years ago, efforts were made to rescue the animals from the menagerie, which was lodged in the burning part. As the fire progressed, a large monkey was seen by the spectators to appear on the roof and to hold on to some pinnacle or other, apparently writhing in terror at its impending incineration. Desperate attempts to reach the unfortunate animal were made. The crowd was breathless with anxiety. Every movement of the rescuers was watched with agonizing interest. At last the ape was reached, and was found to be — a piece of canvas, which had apparently been detached from the building, and which, clinging to some post or pole, had impressed the crowd, by its flapping, with the idea that it was a big monkey writhing with fear and agony. This, I believe, is a well-founded fact. It proves to the full, of course, that, given an idea, supported by a fair show of demonstration, such a thought is certain to become dominant and overruling in the minds of many men. How far this principle may serve to explain many another delusion of human life, I leave my readers to judge.

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## LECTURE EXPERIMENTS ILLUSTRATING PROPERTIES OF SALINE SOLUTIONS.[1]

(1) IN a paper printed in the last volume of this institute's proceedings (Proc. N. S. Inst. Nat. Sci., vii., 368) I pointed out that, according to Kohlrausch's observations, sufficiently dilute solutions of sodium hydroxide have volumes which are less than the volumes which their solvent water would have in the free state, one gram of a solution containing about six per cent of the hydroxide, having a volume 0.0045 of a cubic centimetre less than the water contains. Several other substances are known which exhibit the phenomenon of contraction on solution, in a similarly marked manner, but none which exhibit it to such an extent. This hydroxide, therefore, affords the best means of exhibiting the phenomenon of contraction by a lecture experiment.

The simplest mode of conducting the experiment is to pass the powdered caustic soda, little by little, down a glass tube forming a prolongation of the neck of a large bottle, the bottle and part of the tube having been first filled with distilled (or, indeed, undistilled) water. The substance is quickly dissolved by the water, the strong solution thus formed sinks and mixes with the water below, and the change of volume of the liquid is indicated by the change of height of the column of liquid in the tube. In order that the experiment may be made quickly, the powder must not be allowed to form a cake in the tube where it meets the water. To avoid this, a tube of about seven or eight millimetres in diameter must be used. It should be seven inches in length, and should have the upper end opened out to a funnel shape, to facilitate the introduction of the powder. The tube being necessarily of large bore, the bottle must also be large, so that a small change of volume may be indicated by a comparatively large elevation or depression in the tube.

The hydroxide should be in the form of a powder, not only that its solution may be accomplished quickly, but also because the solution formed must be dilute in order to secure a depression of the liquid in the tube. If it be not powdered, the substance falls to the bottom and forms a strong solution there, which only gradually diffuses into the water above. Even with a fine powder, however, a comparatively strong solution is formed at the bottom. Hence I have found it advisable to catch the powder in a wire gauze cage, attached by sealing-wax to the inner end of the rubber stopper which carries the tube, and to hasten the mixture of the strong solution, formed in the tube and cage, with the water, by diverting the downward currents of the strong solution towards the sides of the bottle by means of a plate of glass hanging horizontally below the cage. If a wide-mouthed bottle be used, a stirrer may be introduced through the stopper, but leakage is thereby rendered more probable.

The full amount of the contraction indicated by Kohlrausch's observations cannot, of course, be shown. For (*a*) the powdered caustic soda already contains a considerable quantity of water; (*b*) the solution of the substance is attended by a development of heat involving a rise of the liquid in the tube; (*c*) the powder carries air with it into the water, which must increase the volume whether it dissolves or remains suspended, for in the latter case, if a quick effect is desired, there is not sufficient time for it to escape up the tube; and (*d*) whatever precautions may be taken to secure a uniform solution throughout the bottle, it cannot be at all completely secured in the time at disposal. But notwithstanding these difficulties, the experiment is a very striking one, especially if projected by a lantern on a screen. As the powdered caustic soda is passed down the tube, little by little, the liquid is seen to dissolve it without any increase in bulk, and if the substance does not already contain too much water, with an actual diminution in bulk, the level of the liquid sinking in the tube. If the powder be added in large quantity, there is a sudden rise of liquid in the tube, followed by a gradual shrinkage, which continues until the level of the liquid is lower than at the outset. The amount of the depression of the liquid in the tube is sometimes small, depending apparently upon the amount of water which the powdered caustic soda has already absorbed. The substance should not be too finely powdered, as in that case it is likely both to have taken up a considerable quantity of water and to carry down with it a considerable quantity of air. The experiment requires only a few minutes to perform.

(2) The working hypothesis which I use when thinking of the phenomena of solution, has led me to the conclusion that elevation of the temperature of a solution will have, if not identically, at any rate in a general way, the same effect on its selective absorption of light, and therefore on its color, as increase in its concentration. All the experimental evidence of which I can find any record bears out this conclusion. But, whether it holds generally or not, it may be shown, by a striking lecture experiment, to hold in the case of two salts, the chlorides of cobalt ($CoCl_2$) and of iron ($FeCl_6$). To do so, make a trough, for projection with a lantern, having thin glass sides, about the size of a lantern-slide, the glass sides being one or two millimetres from one another. It may readily be made by cutting a U-shaped piece from a sheet of India-rubber, and cementing the glass plates to its opposite sides. Half fill the trough with a saturated solution of either salt, and fill up with a weak solution. If cobalt chloride have been used, the solution in the lower part of the trough will at ordinary temperatures be of a purplish blue, that in the upper part red; and it will be obvious that increase of the concentration of this salt involves increase of blueness in the transmitted light. If, now, a Bunsen flame be played carefully over one side of the trough, the solutions rapidly rise in temperature, and both are seen to increase in blueness, the saturated solution becoming deep blue and the weak solution purplish red. If the iron chloride have been used, the solution in the lower part of the trough, before heating, is seen to be of a deep orange color, that in the upper part yellow; and it is obvious that increase in the concentration of this salt involves increase in redness. If, now, the flame be applied as before, the yellow solution is at once seen to become orange and the orange solution red. Owing to the narrowness of the trough and the thinness of its glass sides, sufficient heating to produce a marked change of color occupies only half a minute or so. The same trough may of course be used to project the absorption spectra of these solutions on the screen. If the slit be covered half by the one solution and half by the other, both absorption spectra may be seen at once, side by side, and the gradual variation of the spectra may be watched as the trough is gradually heated.

As a means of showing the variation of the color or absorption

[1] Professor J. G. MacGregor, in Transactions of Nova Scotian Institute of Science, session of 1890–91.